

Appl. No. : 09/549,131  
Filed : April 13, 2000

### AMENDMENTS TO THE CLAIMS

Claims 1-29 (Canceled).

30. (Previously presented) A method of carrying out *in-vivo* plasmapheresis and/or *in-vivo* ultrafiltration of a patient's blood, comprising:

implanting a filter device within a blood vessel of a patient, said filter device comprising a plurality of elongated hollow fibers each fiber having an outer wall, an inner wall and an interior lumen extending along the length thereof, and wherein the fiber wall structure is a continuous change in mass density from said outer wall to said inner wall and comprises a continuum of voids bounded by solid frames, said fiber wall having an asymmetrical pore size and asymmetrical mass density morphology between inner and outer fiber wall surfaces wherein the mass density adjacent to said outer wall is greater than the mass density adjacent to said inner wall, and passing blood plasma and toxins through said fiber wall from the outer wall surface to said interior lumen and directing said blood plasma and toxins from the patient through said interior lumen.

31. (Original) A method of Claim 30 wherein said filter device includes a catheter in direct fluid communication with said interior lumen of said fibers, said method including directing said blood plasma and toxins from the patient through said catheter.

32. (Previously presented) A method of carrying out *in vivo* plasmapheresis and/or *in-vivo* ultrafiltration of a patient's blood, comprising:

implanting a filter device within a blood vessel of a patient, said filter device comprising a plurality of elongated hollow fibers each fiber having an outer wall, an inner wall and an interior lumen extending along the length thereof, and wherein the fiber wall structure is a continuous change in mass density from said outer wall to said inner wall and comprises a continuum of voids bounded by solid frames, said fiber wall having a plurality of zones between inner and outer wall surfaces, each of said zones having a mass density different than the mass density of an adjacent zone, said fiber wall characterized by having a lower mass density zone at the inner wall surface and a higher mass density zone at the outer wall surface and passing blood plasma and toxins through said fiber wall from the outer wall surface to said interior lumen and directing said blood plasma and toxins from the patient through said interior lumen.

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33. (Previously presented) A method of Claim 32 wherein said filter device includes a catheter in direct fluid communication with said interior lumen of said fibers, said method including directing said blood plasma and toxins from the patient through said catheter.

34. (Original) A method of Claim 32 wherein said membrane fiber wall has two mass density zones.

35. (Original) A method of Claim 32 wherein said membrane fiber wall has three mass density zones.

36. (Original) A method of Claim 32 wherein membrane fiber wall has four or more mass density zones.

37. (Original) A method of Claim 32, 33, 34, 35 or 36 wherein each of said zones is characterized by a different average nominal pore size.

38. (Original) A method of Claim 32 wherein said lower mass density zone is characterized by a nominal average pore diameter of between about 1  $\mu\text{m}$  and about 60  $\mu\text{m}$ .

39. (Currently amended) A method of Claim 32 ~~for carrying out plasmapheresis~~ wherein said higher mass density zone is characterized by a nominal average pore diameter of between about 0.3  $\mu\text{m}$  and about 1  $\mu\text{m}$ .

40. (Currently amended) A method of Claim 38 ~~for carrying out plasmapheresis~~ wherein said higher mass density zone is characterized by a nominal average pore diameter of between about 0.3  $\mu\text{m}$  and about 1  $\mu\text{m}$ .

41. (Currently amended) A method of Claim 32 comprising extracting at least 0.75 ml/min/cm<sup>2</sup>/mm Hg of blood plasma at trans-membrane pressures of between about 5 mm Hg and about 20 mm Hg.

42. (Currently amended) A method of Claim 32 ~~for carrying out ultrafiltration~~ wherein said higher mass density zone is characterized by a nominal average pore diameter of between about 0.005  $\mu\text{m}$  and about 0.05  $\mu\text{m}$ .

43. (Currently amended) A method of Claim 38 ~~for carrying out ultrafiltration~~ wherein said higher mass density is characterized by a nominal average pore diameter of between about 0.005  $\mu\text{m}$  and about 0.05  $\mu\text{m}$ .

44. (Previously presented) A method of Claim 38 wherein said membrane has a plasma trans-membrane flux of between about 0.5 ml/min/cm<sup>2</sup> and about 9 ml/min/cm<sup>2</sup> @ 10mm Hg.

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45. (Original) A method of Claim 32 wherein said lower mass density is characterized by a nominal average pore diameter of between about 5  $\mu\text{m}$  and about 40  $\mu\text{m}$ .

46. (Currently amended) A method of Claim 45 ~~for carrying out plasmapheresis~~ wherein said higher mass density is characterized by a nominal average pore diameter of between about 0.7  $\mu\text{m}$  and about 0.8  $\mu\text{m}$ .

47. (Previously presented) A method of Claim 45 wherein said membrane has plasma trans-membrane flux of between 0.75 ml/min/cm<sup>2</sup> and about 4 ml/min/cm<sup>2</sup>/ @ 10mm Hg.

48. (Currently amended) A method of Claim 45 ~~for carrying out ultrafiltration~~ wherein said higher mass density is characterized by a nominal average pore of between about 0.01  $\mu\text{m}$  and about 0.03  $\mu\text{m}$ .

49. (Currently amended) A method of Claim 32 ~~for carrying out ultrafiltration~~ wherein said membrane has a trans-membrane flux (H<sub>2</sub>O) of between about 0.75 and about 4 ml/min/cm<sup>2</sup>/ @ 10mm Hg

Claims 50-51 (Canceled).

52. (Previously presented) A method of Claim 30 wherein said fiber wall comprises a plurality of concentric circumferential zones between inner and outer wall surfaces, each of said circumferential zones comprising a continuous wall structure of pores and frames, wherein the mass density of adjacent concentric circumferential zones is different and wherein the mass density of said concentric circumferential zones decreases from said outer wall to said inner wall.

Claim 53 (Canceled).

54. (Currently Amended) A method of Claim ~~52~~ 53 wherein said membrane fiber wall has two mass density zones.

55. (Currently Amended) A method of Claim ~~52~~ 53 wherein said membrane fiber wall has three mass density zones.

56. (Currently Amended) A method of Claim ~~52~~ 53 wherein membrane fiber wall has four or more mass density zones.